Wildlife in the Havukal – Warwick estates, Nilgiris: a field survey and inventory report

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Cover Photographs

Front cover
Top: Indian Giant Squirrel *Ratufa indica* (left) and Chestnut-headed Bee-eater *Merops leschenaulti* (right)
Centre: A view of the Havukal – Warwick tea and shola forests landscape
Bottom: Psyche *Leptosia nina* (left) and Blue Darner *Anax immaculifrons* (right)

Back cover
A *Salix tetrasperma* tree in bloom in the estate

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P. Jeganathan and Ranjini Murali

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EXECUTIVE SUMMARY

The Havukal – Warwick estates are located at Kotagiri, in the Nilgiris, Western Ghats, a biodiversity hotspot. These estates are among the few estates in South India that are Rainforest Alliance certified. We visited the Havukal – Warwick estates between 13 and 18 February 2011, to create a wildlife inventory as well as to suggest areas of improvement in aspects pertaining to the SAN criteria. We surveyed different habitats−tea, coffee, cardamom, and forest fragments, for odonates (dragonflies and damselflies), butterflies, birds and mammals using a combination of field methods such as transects and camera traps.

The survey confirmed the occurrence of at least 108 animal species in the area. Odonate (dragonfly and damselfly) sampling carried out along the streams and marshes in different habitats revealed five species of dragonflies (no damselflies were encountered during this survey). We recorded 24 butterfly species, mostly light-loving species (fruit feeding and canopy-dwelling butterflies were not surveyed at this time). We recorded 61 bird species, including four Western Ghats endemics, and eight species of migrants. Nilgiri Laughingthrush, an endemic restricted to Nilgiris was seen quite frequently in the area. Direct sighting, camera trap photographs, and indirect evidences such as scats and tracks confirmed the occurrence of 17 species of mammals, including the Small-clawed Otter along streams and the Western Ghats endemic Brown Palm Civet and several threatened larger mammal species.

This preliminary survey results shows that forest fragments and the strip forests along the streams had higher richness and abundance of birds and mammals followed by coffee and tea. However more sampling is needed during different seasons to confirm this pattern and make a more complete inventory, especially of the butterflies and odonates. Forest fragments and forests along the streams within the estates are vital for several wildlife species. These places were repository for several endemic species such as Brown Palm Civet, Black-and-Orange Flycatcher and Nilgiri Laughingthrush. The value of these as refuges and corridors as well as importance of micro-habitats such as dead trees (snags) and native shade trees in plantations are discussed along with comments on best practices and areas for improvement related to the SAN Sustainable Agriculture Standard.

ORGANISATION OF THE REPORT

The report is organised into the following sections. Unless otherwise mentioned, all photographs used in this report were obtained by the authors during the wildlife inventory survey.

- Introduction
- Objectives
  - *Box: The SAN Sustainable Agriculture Standard, Rainforest Alliance, and NCF*
- Study Area
- Methods
  - Analysis
- Results
  - Odonates, Butterflies, Birds, Mammals
- Discussion
- Conclusions and recommendations
  - Wildlife Inventory (Criterion 3.1 of SAN Standard)
  - Important ecosystems and habitats (Criterion 3.2 of SAN Standard)
  - *Box: What bird should represent Havukal Tea?*
  - Observations on implementation of SAN Sustainable Agriculture Standard
- References

INTRODUCTION

As agricultural activity expands and intensifies worldwide, there has been increasing concern over the conservation of biodiversity and remnant ecosystems in agricultural landscapes. This is of special concern in biodiversity-rich areas such as the Western Ghats hill range in India, where substantial areas have been historically lost due to conversion to timber and monoculture plantations (Kumar *et al.* 2004). In the Western Ghats as elsewhere, biologists are exploring opportunities for landscape-level conservation extending beyond the existing fragmented wildlife reserves into adjoining areas such as coffee and tea plantations (Mudappa and Raman 2007).

Environmental and health-related concerns has traditionally led some plantations to going organic, but little effort has been made in other realms such as conservation of natural forests, wildlife, and biodiversity. As corporate stewardship of the environment is becoming increasingly important for business, these additional concerns are being incorporated through voluntary and corporate social responsibility initiatives as well as market-driven incentives linked to certification.

The Havukal and Warwick estates located at Kotagiri, in the hills of the Nilgiris in the Western Ghats biodiversity hotspot is a case in point. The Havukal-Warwick group is among the first set of plantations in Southern India to adopt a set of better social, environmental, and land-use practices listed in the Sustainable Agriculture Standard of the Sustainable Agriculture Network (SAN), leading to Rainforest Alliance certification for their tea produce. In relation to the environment, among the ~100 criteria of the SAN Standard, there are 6 criteria under Principle 3 (Wildlife Protection) that complement criteria under other Principles related to Ecosystem Conservation, Water Conservation, Soil Management and Conservation, and Integrated Crop and Waste Management (Sustainable Agriculture Network 2010).

OBJECTIVES

The objectives of the present brief survey was to create a wildlife inventory in the estates, especially with respect to **Criterion 3.1** under Principle 3 (Wildlife Protection) of the SAN Sustainable Agriculture Standard (July 2010) that states that *An inventory of wildlife and wildlife habitats found on the farm must be created and maintained*. We also use the observations to suggest areas that would be important under **Criterion 3.2** that states that *Ecosystems that provide habitats for wildlife living on the farm, or that pass through the farm during migration, must be protected and restored. The farm takes special measures to protect threatened or endangered species.* Finally, we also used the opportunity to train farm workers and personnel from Havukal on the methods used for carrying out wildlife inventories, and to create awareness about wildlife and its conservation among them. Based on the observations, we suggest areas of improvement in additional aspects pertaining to the SAN criteria.

The SAN Sustainable Agriculture Standard, Rainforest Alliance, and NCF

Rainforest Alliance is an international non-profit organisation working in different fields of sustainable development, primarily agriculture, tourism, and forestry. Rainforest Alliance certification is a system of standards for sustainability in agriculture that include conservation of wildlife and natural ecosystems, the well-being of workers and their communities, and integrated and efficient farming practices. Farms and estates that meet the comprehensive criteria of the SAN Standard earn the right to use the Rainforest Alliance Certified™ seal (Sustainable Agriculture Network 2010).

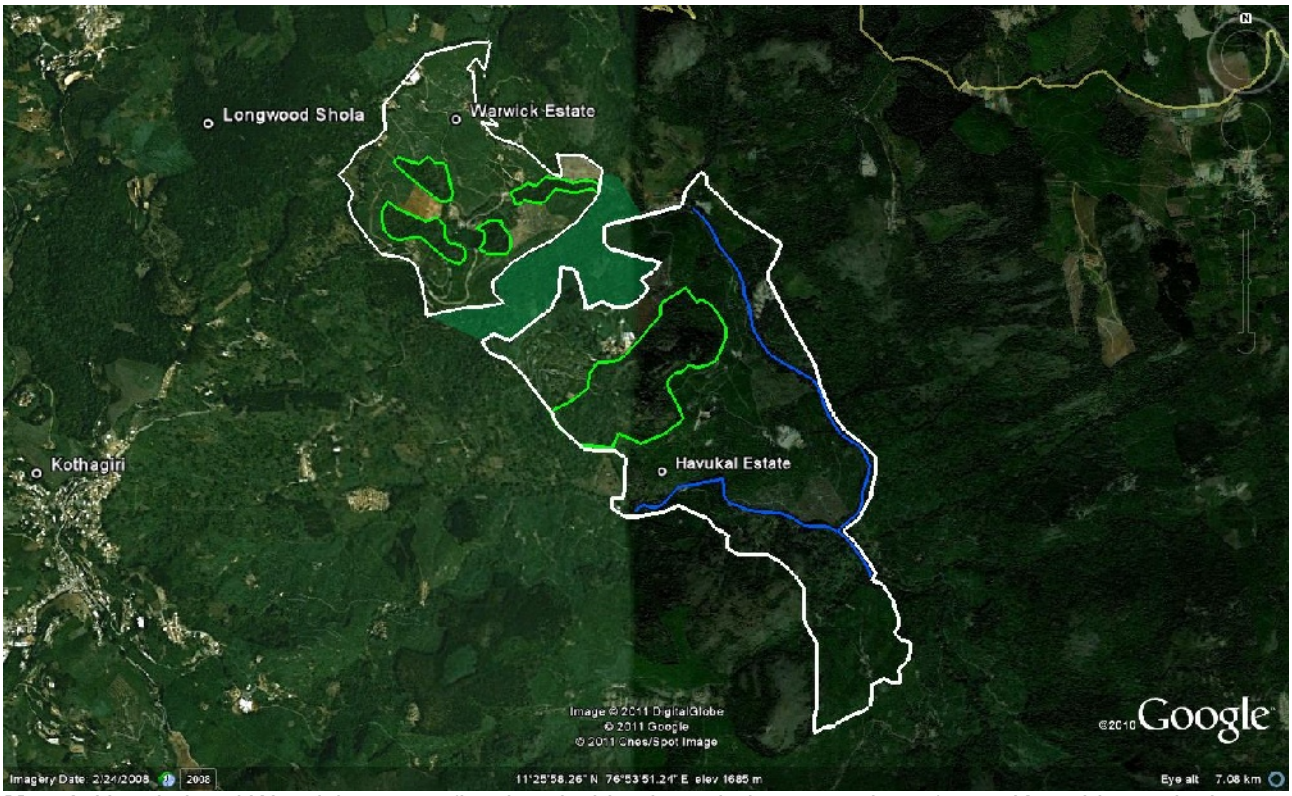
The Sustainable Agriculture Network (SAN) is a network of non-profit conservation organisations across several countries working towards biodiversity conservation and human development through the development of social and environmental standards. In India, the Nature Conservation Foundation (NCF) is a member of the SAN. NCF is a non-profit NGO, focusing on science-driven and socially responsible conservation across India. NCF collaborates with Rainforest Alliance and the SAN to identify and promote the adopt of best agricultural practices in India, especially in tea, coffee, and cardamom plantations. NCF spreads awareness of the SAN standards through workshops amongst the planter community and other stakeholders. In addition, NCF conducts diagnostic audits and training, carries out wildlife research and inventories in farms and natural ecosystems, and outreach. For more information on NCF see www.conservation.in and for more on the sustainable agriculture program see www.ecoagriculture.in.

STUDY AREA

Havukal and Warwick estates are located near the hill town of Kotagiri in the Nilgiris, at around 11°26′07″ N and 76°53′41″ E at an elevation of around 1,850 m above mean sea level. The Nilgiris are a biogeographically significant range just north of the Palghat Gap in the Western Ghats biodiversity hotspot known for the occurrence of a diverse array of plants and animals including many that are threatened or endemic to the region (Daniels and Venkatesan 2008). Declared as the Nilgiri Biosphere Reserve, the region contains an array of natural ecosystems ranging from dry thron forests in the rain-shadow region and foothills, through deciduous and evergreen types. In the higher elevations (above ~1600 m) such as around Kotagiri and Ooty, the **natural vegetation type is shola – grasslands** comprising stunted montane wet evergreen forest alternating with short grasslands. The region underwent severe transformation from the 1860s with tea and other plantations replacing the shola-grassland vegetation (Sekar 2004). Many other developmental activities including urbanisation, industry, and hydroelectric projects have also disturbed and fragmented the region. The region is now proposed as a World Heritage Site (UNESCO 2006).

Warwick estate occupies a total area of 156.03 ha. It is mainly under tea (145 ha) with the remaining area under buildings (5.5 ha), roads and trails (2 ha), drains (0.66 ha), rocks, swamps, and other areas (3.2 ha). The well known Longwood Shola is situated to the north and east of Warwick and to the western side are estates of TANTEA. The Warwick plantation is interspersed with four Reserved Forest (shola) fragments, one of which extends outside along the southern boundary as a shola patch that separates Warwick from Havukal estate (see **Map 1**).

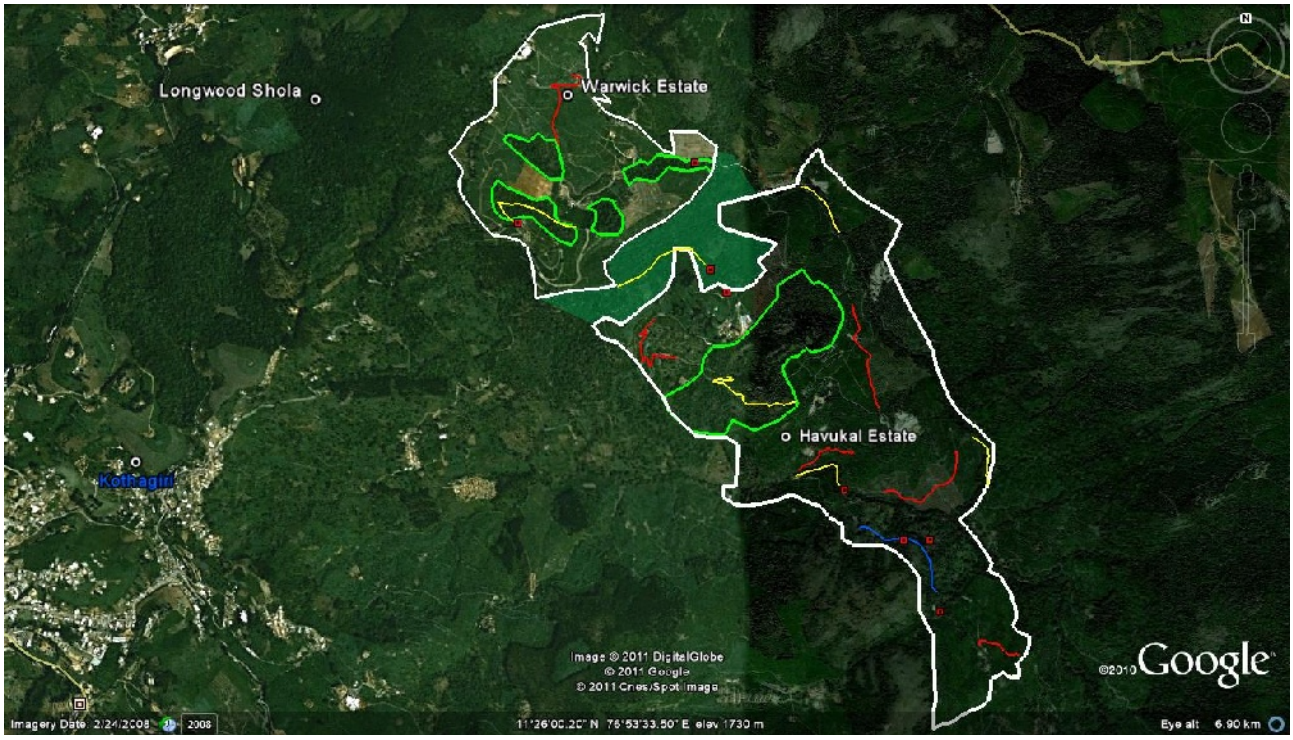
Havukal is situated to the south of Warwick estate across a Reserved Forest (shola). The total area of Havukal is 399.86 ha of which tea is 304.94 ha, cardamom is 20.50 ha, coffee is 9.0 ha, rocks and swamps are 24.11 ha and the rest is in buildings (12.45 ha), roads (14.18 ha), and drains (14.18 ha). There are two Reserved Forest (shola) fragments within the Havukal estate in the northern region. There are also Reserved Forests along the eastern boundary and part of the northern boundary (**Map 1**). The Kairbetta estate (Havukal group, but not sampled in this survey) is to the east of Havukal; on the southern side they share their boundary with Burnside and Deepdale estates (Stanes group). In Havukal, the main produce is tea, although they have smaller fractions of coffee and cardamom, and some floriculture within their estates.



Map 1. Havukal and Warwick estates (bordered white, boundaries approximate) near Kotagiri town in the Nilgiris. Forest fragments within are bordered green, sampled rivers are indicated in blue. Note the green patch showing forest fragment between the two estates and proximity to Longwood Shola.

METHODS

We visited the Havukal and Warwick estates from 13 February 2011 to 18 Februrary 2011. Within these estates, we surveyed different habitats—tea, coffee, cardamom, and forest fragments, for odonates (dragonflies and damselflies), butterflies, birds, and mammals. Using a combination of field methods to create a list of species found in this area and a preliminary assessment of their distribution and abundance. The surveys were mostly carried out at times of day when these animals were active and the weather was sunny. Information from both the estates were pooled and then analysed according to the habitat. Standard references and field guides were used to identify odonates (Subramanian 2009), butterflies (Kunte 2000, Kehimkar 2008), birds (Grimmett *et al.* 1998), mammals (Prater 1993, Menon 2003), and plants (Keystone Foundation 2006, Neginhal 2004). Besides recording of target species using specific survey field methods detailed below, we also noted all records of these species during opportunistic observations in the estates. Locations of transects surveyed and camera-trap placement are indicated in **Map 2**.



Map 2. Location of transect trails walked in shola forests and streamside forest (yellow lines), in tea (red lines) and coffee (blue line), and camera trap location (red squares). Estate boundaries approximate.

Odonates were surveyed in the streams, marshes, and stagnant water bodies present in tea, forest, coffee and cardamom, walking slowly along the embankment or in the stream around noon, the peak time of their activity. Five forest stream transects and one transect in tea, each 500 m long, were walked (total 3 km). Three tea marshes and one forest marsh were sampled by walking along the embankment, observing for a duration of about 15 – 20 min to record damselflies. The total time spent in the tea marshes was 50 min and the total time spent in the forest marsh was 20 min. A total of 234 min was spent in the forest and tea habitats in both the estates.

Butterflies were sampled along 10 transects of 500 m length in tea, forest fragments, and coffee – cardamom habitats (total 5 km). Sampling was carried out by walking at a steady pace, along a path (natural trail or road). All butterflies within 20 m on either side of the centre of the path were recorded. Four transects were walked in tea, one transect in coffee – cardamom, and five in shola forest.

Birds were sampled along 11 transects of 500 m length in tea, forest fragment, and coffee-cardamom habitats (total 5.5 km). Sampling was carried out by walking at a steady pace, along a path (natural trail or road), usually 500 metres long. All birds within 25 metres on either side of the centre of the path were recorded either through direct sighting or by identifying their calls. Five transects were walked in tea, five in the forest fragment, and one in coffee – cardamom.

Mammals were surveyed using three methods: transects, camera-trapping, and nocturnal spotlighting. Nine transects were walked: four transects in tea of 500 m each (total 2 km), five transects in forest of 250 m, 500 m, 500 m, 700 m, and 1000 m length (total 2.95 km) looking for indirect signs such as droppings and footprints. Any animal sightings during these transects were also recorded. Camera traps were set up in eight different locations spread around the estate to capture photos of nocturnal mammals for a total effort of 16 camera-trap nights. Night searches with spotlighting was conducted by an observer using a vehicle, driving slowly at a speed of 20 kmph and any mammals sighted were recorded. Two night-drives were conducted. Apart from the above methods, local people were shown photos of animals and asked to identify the ones they had seen on the estate.

Analysis

As the sampling effort was limited and the focus was primarily an inventory, we present checklist of species confirmed by direct sighting or camera trap. Based on the data collected from the transects on butterflies and birds, we use the technique of rarefaction analysis to compare species richness (number of species) across the three main habitats surveyed (forest, tea, and coffee – cardamom). In ecology, rarefaction is a technique used to compare species richness from samples of different sizes by standardising to estimate the number of species for a given sample size of individuals. The rarefaction curve is a plot of the number of species (y-axis) as a function of the number of individuals sampled (x-axis). The rarefaction curves and graphs were generated using the computer program ECOSIM and the R statistical and programming environment.

In addition, for mammals, we used the frequency of encounter of indirect evidence (droppings, tracks) pooled across all transects within a habitat (tea, forest) to estimate average encounter rate as an index of relative abundance. Measures of variation (standard deviation) are not presented as the data were limited and the survey was not designed for abundance estimation.

Gaur seen during a transect survey in the cardamom plantation.

RESULTS

Odonates: Very few odonates were encountered: 14 individuals belonging to five species of dragonflies, in total. Four individuals belonging to three species of dragonflies were encountered in the marsh in tea estates. Three individuals of two species of dragonflies were recorded in the marsh in the forest. Seven individuals of three species of dragonflies were recorded in the stream in tea estate. No odonate was recorded in the forest stream. Blue-tailed Forest Hawk and the Tricoloured Marsh Hawk were the frequently seen dragonflies in this region during this survey. No damselflies were seen during this survey. See **Table 1** for a list of the species encountered in each of the habitats.

Table 1. Occurrence of odonate species (dragonflies and damselflies) in different habitats during the wildlife inventory survey at Havukal-Warwick estates (13 – 18 February 2011).

No.	Common Name	Scientific Name	Forest marsh	Forest stream	Tea marsh	Tea stream
1	Blue Darner	*Anax immaculifrons*	+	-	-	-
2	Ground Skimmer	*Diplacodes trivialis*	-	-	+	-
3	Blue Marsh Hawk	*Orthetrum glaucum*	+	-	-	+
4	Tricoloured Marsh Hawk	*Orthetrum luzonicum*	-	-	+	+
5	Blue-Tailed Forest Hawk	*Orthetrum triangulare*	-	-	+	+

+ = present, - = not seen

Butterflies: There were 64 individuals belonging to 24 species of butterflies recorded during this survey. Nine individuals of seven species in coffee, 34 individuals of 16 species in forest fragments and 21 individuals of 12 species in tea, were recorded. Common Jezebel was the most common in coffee. Common Emigrant, Common Evening Brown, and Common Sailor were most often encountered in the forest fragment. Common Emigrant and the Plain Puffin were the most common in tea. **Table 2** lists the species seen in each of the habitats. The rarefaction curves do not suggest major difference between the three habitats in butterfly species richness, but as the sample size was limited and the curves are still ascending, it indicates that there are more species to be recorded at each of the sites (**Figure 1**).

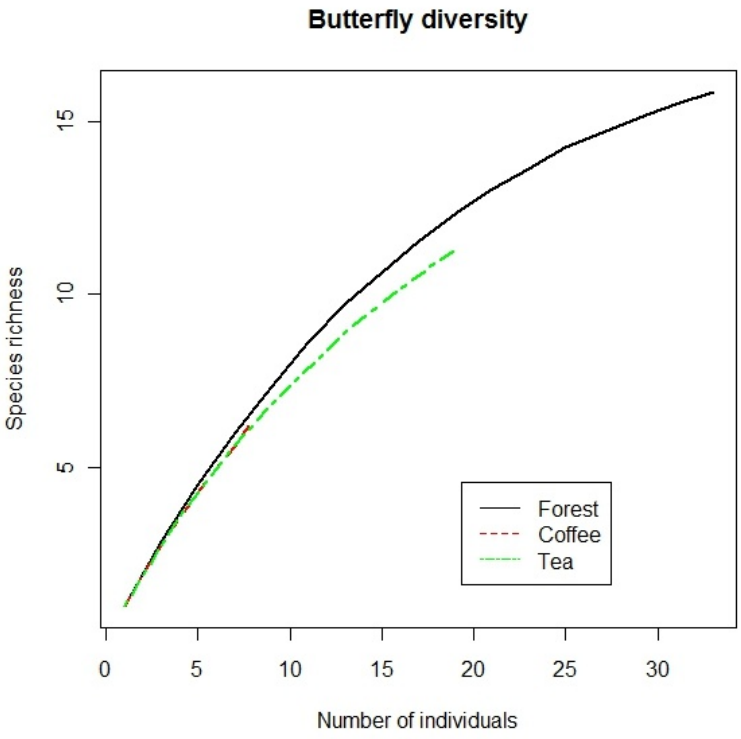


Figure 1. Comparative butterfly species richness across three main habitats using rarefaction curves.

Table 2. List of butterfly species recorded during the wildlife inventory survey at Havukal-Warwick estates (13 – 18 February 2011)

No.	Common Name	Scientific Name	Tea	Coffee	Forest Fragment
1	Common Bluebottle	*Graphium sarpendon*	+	-	+
2	Red Helen	*Papilio helenus*	-	-	+
3	Blue Mormon	*Papilio polymnestor*	+	-	-
4	Paris Peacock	*Papilio paris*	+	-	+
5	Common Emigrant	*Catopsilia pomona*	+	+	+
6	Common Grass Yellow	*Eurema hecabe*	+	-	+
7	Psyche	*Leptosia nina*	-	+	+
8	Great Orange Tip	*Hebomoia glaucippe*	+	-	-
9	Common Jezebel	*Delias eucharis*	+	+	+
10	Plain Puffin	*Appias indra*	+	-	+
11	Common Albatross	*Appias albina*	+	-	-
12	Common Evening Brown	*Melanitis leda*	-	+	+
13	Common Fourring	*Ypthima huebneri*	+	-	+
14	Cruiser	*Vindula erota*	-	-	+
15	Common Sailor	*Neptis hylas*	+	+	+
16	Common Castor	*Ariadne merione*	-	+	+
17	Yellow Pansy	*Junonia hierta*	+	-	+
18	Chocolate Pansy	*Junonia iphita*	-	-	+
19	Blue Admiral	*Kaniska canace*	-	-	+
20	Striped Tiger	*Danaus genutia*	+	-	-
21	Nilgiri Tiger	*Parantica nilgiriensis*	-	-	+
23	Common Cerulean	*Jamides celeno*	+	-	-
24	Unidentified Blue		-	+	+

+ = present, - = not seen

Red Helen mud-puddling at otter spraint (to obtain salts and nutrients)

Birds: A total of 61 species were recorded including opportunistic sightings. The occurrence of the Nilgiri Laughingthrush (endemic to Nilgiris) and five other Western Ghats endemic species and migrants such as the rare Pied Thrush is notable.

On the transects 178 individuals belonging to 44 species were recorded. We recorded 76 individuals of 11 species in tea, 57 individuals of 23 species in coffee, and 109 individuals of 25 species in forest fragment. In tea, Pied Bushchat and Red-Whiskered Bulbul were the most common. The Oriental White-Eye and Red-whiskered Bulbul were the most common in coffee. In the forest, Black Bulbul, Oriental White-Eye, and Red-whiskered Bulbul were the most common species recorded. The list of bird species recorded is given in **Table 3**. Bird species richness was discernably higher in forest and coffee than in tea. The curves indicate that there were still many species left to be recorded, especially in the forest and coffee habitats (**Figure 2**).

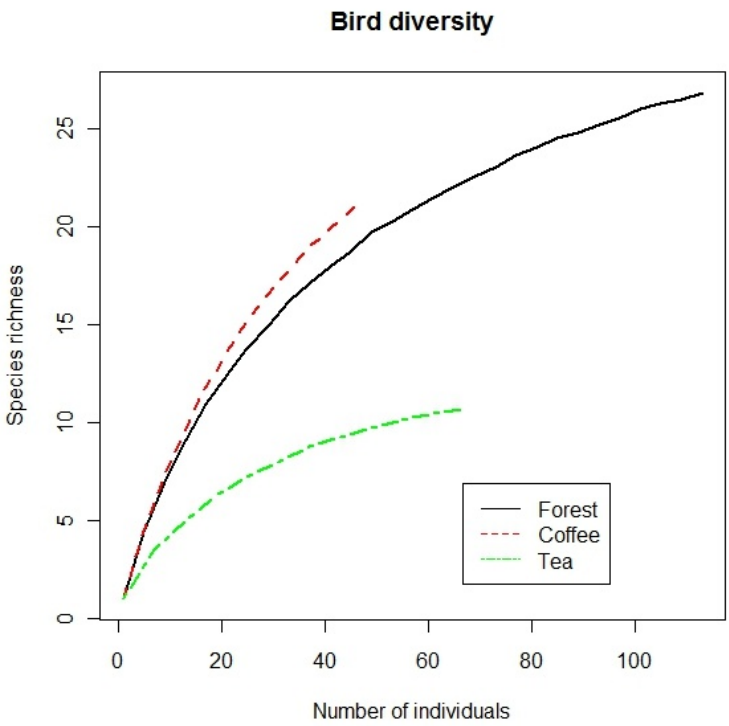


Figure 2. Comparative bird species richness across three main habitats using rarefaction curves.

Common birds typical of tea
Top: Pied Bushchat
Bottom: Red-whiskered Bulbul

Birds frequent in coffee
Top: Oriental White-Eye
Bottom: Grey-headed Canary Flycatcher

Endemic birds in shola forest
Top: Black-and-Orange Flycatcher
Bottom: Crimson-backed Sunbird

Table 3. List of bird species recorded during the wildlife inventory survey at Havukal-Warwick estates (13 – 18 February 2011)

No.	Common Name	Scientific name	Tea	Coffee & cardamom	Forest
1	Red Spurfowl	*Galloperdix spadicea*	-	-	+
2	Grey Junglefowl	*Gallus sonneratii*	-	+	+
3	Greater Flameback	*Chrysocolaptes lucidus*	-	+	-
4	White-cheeked Barbet*	*Megalaima viridis*	-	+	+
5	Crimson-fronted Barbet	*Megalaima rubricapilla*	-	-	+
6	Common Hoopoe	*Upupa epops*	-	+	-
7	Chestnut-headed Bee-eater	*Merops leschenaulti*	-	-	+
8	Vernal Hanging Parrot	*Loriculus vernalis*	-	+	-
9	Malabar Parakeet*	*Psittacula columboides*	-	+	-
10	Grey Nightjar	*Caprimulgus indicus*	+	-	
11	Rock Pigeon	*Columba livia*	+	-	-
12	Emerald Dove	*Chalcophaps indica*	-	-	+
13	Crested Serpent Eagle	*Spilornis cheela*	+	-	+
14	Crested Goshawk	*Accipiter trivirgatus*	-	-	+
15	Oriental Honey-Buzzard	*Pernis ptilorhynchus*	-	+	-
16	Changeable Hawk Eagle	*Spizaetus cirrhatus*	-	-	+
17	Asian Fairy Bluebird	*Irena puella*	-	-	+
18	Large-billed Crow	*Corvus macrorhynchos*	-	+	-
19	Ashy Woodswallow	*Artamus fuscus*	+	-	-
20	Scarlet Minivet	*Pericrocotus flammeus*	-	+	-
21	Bar-Winged Flycatcher-shrike	*Hemipus picatus*			+
22	Ashy Drongo#	*Dicrurus leucophaeus*	-	+	+
23	Common Iora	*Aegithina tiphia*	-	-	+
24	Malabar Whistling Thrush	*Myophonus horsfieldii*	-	-	+
25	Pied Thrush#	*Zoothera wardii*	-	-	+
26	Eurasian Blackbird	*Turdus merula*	+	-	-
27	Asian Brown Flycatcher#	*Muscicapa dauurica*	-	+	-
28	Rusty-tailed Flycatcher	*Muscicapa ruficauda*	-	-	+
29	Black-and-Orange Flycatcher*	*Ficedula nigrorufa*	-	-	+
30	Nilgiri Flycatcher*	*Eumyias albicaudata*	-	-	+
31	Tickell's Blue Flycatcher	*Cyornis tickelliae*	-	-	+
32	Grey-Headed Canary Flycatcher	*Culicicapa ceylonensis*	-	+	+
33	Indian Blue Robin#	*Luscinia brunnea*	-	-	+
34	Oriental Magpie-Robin	*Copsychus saularis*	+	+	-
35	Pied Bushchat	*Saxicola caprata*	+	-	-
36	Common Hill-Myna@	*Gracula religiosa*	-	+	-
37	Velvet-Fronted Nuthatch	*Sitta frontalis*	-	+	-
38	Black-Lored Tit	*Parus xanthogenys*	-	+	+
39	Dusky Crag Martin	*Hirundo concolor*	+	-	-
40	Pacific Swallow	*Hirundo tahitica*	+	+	-
41	Red-rumped Swallow	*Hirundo daurica*	+	-	-
42	Red-whiskered Bulbul	*Pycnonotus jocosus*	+	+	+

No.	Common Name	Scientific name	Tea	Coffee & cardamom	Forest
43	Red-vented Bulbul	*Pycnonotus cafer*	+	-	-
44	Yellow-browed Bulbul	*Iole indica*	-	+	+
45	Black Bulbul	*Hypsipetes leucocephalus*	-	+	+
46	Ashy Prinia	*Prinia socialis*	+	-	-
47	Oriental White-Eye	*Zosterops palpebrosus*	+	+	+
48	Blyth's Reed Warbler[#]	*Acrocephalus dumetorum*	-	-	+
49	Common Tailorbird	*Orthotomus sutorius*	-	+	+
50	Greenish Warbler[#]	*Phylloscopus trochiloides*	-	+	+
51	Nilgiri Laughingthrush**	*Garrulax cachinnans*	+	-	+
52	Indian Scimitar Babbler	*Pomatorhinus horsfieldii*	-	+	+
53	Puff-throated Babbler	*Pellorneum ruficeps*	-	-	+
54	Jungle Babbler	*Turdoides striatus*	+	-	+
55	Brown-cheeked Fulvetta	*Alcippe poioicephala*	-	-	+
56	Plain Flowerpecker	*Dicaeum concolor*	-	+	+
57	Crimson-backed Sunbird*	*Nectarinia minima*	-	+	-
58	Little Spiderhunter	*Arachnothera longirostra*	-	+	+
59	House Sparrow	*Passer domesticus*	+	-	-
60	Grey Wagtail[#]	*Motacilla cinerea*	+	-	+
61	Common Rosefinch[#]	*Carpodacus erythrinus*	-	-	+

+ = present, - = not seen, * = endemic to Western Ghats, ** endemic to Nilgiris, [#] = migrant, [@] = Schedule I

Photographs of two migrant bird species found in the Havukal – Warwick estates

Left: The Grey Wagtail likes the vicinity of streams, roads, and paths
Right: The Greenish Warbler is a small bird found commonly in the canopy
(To learn more about these and other migrant birds in India see: www.migrantwatch.in)

Mammals: There were 16 identified species of mammals and 2 unidentified species (a rodent and a small cat) recorded in the estate using indirect signs, sightings, and camera traps in the different habitats (**Table 4**). Camera traps captured photographs of five species of mammals and one bird (Malabar Whistling Thrush). The Brown Palm Civet was photographed in three out of five camera traps set in the forest. Out of six streams sampled (five forest streams, one tea stream) indirect signs (spraints and footprints) of Small-clawed Otter were seen in all the forest streams. The mammals most frequently sighted during the transect walks were the Indian Giant Squirrel and Gaur. Black-naped Hare and Large Brown Flying Squirrel were seen during the night drives. We recorded Dusky-striped Squirrel and Ruddy Mongoose opportunistically. The local people recognised photos of the Stripe-necked Mongoose when shown photos; however, this species was not recorded during transect walks or in supplementary opportunistic observations.

Brown Palm Civet camera-trapped in a shola forest

Sloth Bear along estate road in coffee area

Table 4. List of mammal species recorded during the wildlife inventory survey at Havukal-Warwick estates (13 – 18 February 2011).

No.	Common Name	Scientific Name	Seen	Indirect evidence*	Camera-trap photo
1	Bonnet Macaque	*Macaca radiata*	+		
2	Indian Muntjac	*Muntiacus muntjak*		+	
3	Gaur@	*Bos gaurus*	+		
4	Wild Pig	*Sus scrofa*	+		
5	Sloth Bear@	*Melursus ursinus*			+
6	Leopard@	*Panthera pardus*		+	
7	Unidentified small cat			+	
8	Small-clawed Otter@	*Amblonyx cinereus*		+	
9	Small Indian Civet	*Viverricula indica*			+
10	Brown Palm Civet	*Paradoxurus jerdoni*			+
11	Ruddy Mongoose	*Herpestes smithii*	+		
12	Black-naped Hare	*Lepus nigricollis*	+		+
13	Indian Porcupine	*Hystrix indica*		+	
14	Indian Giant Squirrel	*Ratufa indica*	+		
15	Three-striped Palm Squirrel	*Funambulus palmarum*	+		
16	Dusky-striped Squirrel	*Funambulus sublineatus*	+		
17	Large Brown Flying Squirrel	*Petaurista philippensis*	+		
18	Unidentified rodent				+

***** scats, pellets, spraint, or tracks; @ - Species in Schedule I of Wildlife (Protection) Act 1972

Black-naped Hare photo-trapped in tea

Small Indian Civet photo-trapped in tea

An unidentified rat at the camera-trap

Large Brown Flying Squirrel at night in coffee area

More mammal species were noted using the forest habitat than tea plantations, particularly species such as Indian Giant Squirrel, Muntjac, Small-Clawed Otter, and other carnivores. The common species found in the tea estates were Black-naped Hare, Indian Porcupine, Gaur, and Sloth Bear. See **Table 5** for a preliminary estimate of relative abundance.

Table 5. Preliminary estimate of relative abundance of mammals based on encounter rates (number/km) of indirect evidences such as tracks and droppings in Havukal-Warwick estates.

No.	Common Name	Tea	Forest	Notes
1	Barking deer	-	0.3	
2	Black-naped Hare	2.5	2.0	
3	Civet sp.	2.5	4.4	Possibly Brown Palm Civet and/or Small Indian Civet
4	Gaur	2.0	1.4	
5	Indian Giant Squirrel	-	1.0	
6	Leopard	-	1.0	
7	Small cat	-	0.3	
8	Small-clawed Otter	-	7.5	
9	Indian Porcupine	6.0	-	
10	Primate	-	0.3	Probably Bonnet Macaque
11	Sloth Bear	4.0	3.4	
12	Wild Boar	-	0.3	

DISCUSSION

Odonates: Few odonates were encountered during this survey, even in potentially suitable habitats, and damselflies were surprisingly not seen at all. Even common damselfly species of the hill streams of the Western Ghats such as the Stream Ruby *Rhinocypha bisignata* and the Stream Glory *Neurobasis chinensis* were not observed. The reason for the low abundance as well as low species richness of odonates could be because of the altitude and cold climate throughout the sampling period. It may also be possible that the flight season of many odonates may not have been during the sampling period. More time needs to be spent looking exclusively for smaller damselflies such as *Acigrion* species and *Agricnemis* species.

Butterflies: There were more species recorded in the forest fragments than in tea. This suggests that the food plants and habitat of some butterfly species were not present in tea. In total 24 species were recorded, but the fruit-feeding butterflies and the canopy-dwelling butterflies, sighted at a distance, were excluded due to sampling constraints. According to the species richness curves, the forest fragment appeared to have only a slightly higher richness followed by tea and coffee that were similar. However, coffee and forest are likely to have a higher diversity of butterflies than recorded in these two habitats during this survey because: 1. Almost all the species encountered in tea were recorded but canopy-dwelling butterflies in coffee and forest were excluded due to sampling and visibility constraints. 2. Only one transect was walked in coffee; more effort would certainly lead to more species being recorded. 3. There were many forest fragments in tea and most of the species were encountered close to the forest fragments. It is likely that these species were just passing through tea when they were recorded. More sampling needs to be done before this pattern can be confirmed.

Birds: The endemic species encountered only in forest fragments and coffee can be seen in the **Table 3**. Eight species of migrants were recorded and the most frequent species in forest and coffee was the Greenish Warbler. Forest and coffee habitats had much higher bird species richness than in tea. It is clear that having a better tree canopy cover, as shade in coffee and as a diverse array of species in forests contributes to the greater bird diversity in comparison with the intensive monoculture of tea with sparse tree cover of only alien silver oak (*Grevillea robusta*) trees. Similar patterns have been revealed in studies from other parts of the Western Ghats (Raman 2006, Anand *et al.* 2010, Sidhu *et al.* 2010). Although there were 76 individuals recorded in tea, the conservation value of the habitat was very low as most (56.6%) of the individuals were Red-Whiskered Bulbul, a very common and widespread species.

While interviewing the locals we learned that the Great Hornbill *Buceros bicornis* is a seasonal visitor to some of the forest patches within the estates especially during the month of April when certain wild figs *Ficus sp.* start fruiting in that region. It is also pertinent to point out here that Longwood Shola which is identified as one of the Important Bird Areas of Western Ghats (Islam & Rahmani 2004) is adjacent to these estates.

Mammals: All the streams passing through the estates seem very important for Small-clawed Otter as signs of these animals were seen in all the streams sampled. Similarly, the Brown Palm Civet and the Small Indian Civet seem common in the estates as several signs were seen and photos of these civets were obtained in the camera traps. Local people also mentioned the occurrence of Sambar (*Cervus unicolor*) and Stripe-necked Mongoose (*Herpestes vitticollis*) in the area. We have also recorded scats of Leopard and a small cat (possibly Leopard Cat *Prionailurus bengalensis*). These carnivores along with Small-clawed Otter, Sloth Bear, Gaur, are endangered or threatened species receiving special protection through listing under Schedule I of the Wildlife (Protection) Act 1972 (Anonymous 2009).

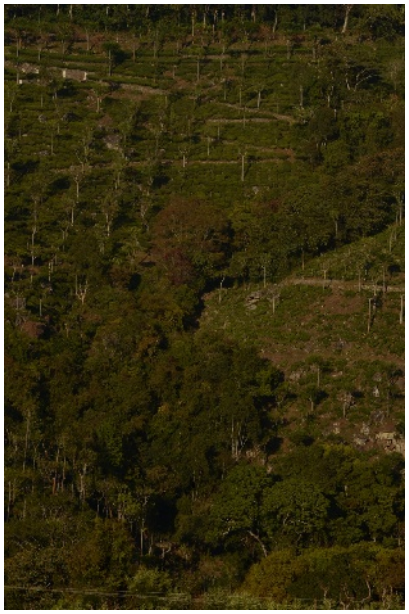
CONCLUSIONS AND RECOMMENDATIONS

Wildlife Inventory (Criterion 3.1 of SAN Standard): It is notable that despite the short duration of the field survey around 108 animal species were recorded in the Havukal – Warwick estates and the shola forest patches and streams in and around the estates. While tea plantation by itself is low in diversity, it is used by many species including those that move between forest patches and the suitability of tea for wildlife can be improved by following sustainable land-use practices. The importance of other habitats in promoting and

sustaining the occurrence of many wildlife species in the landscape should be recognised through special protection and consservation efforts. It is also clear that the lists are incomplete, and further or periodic survey is recommended to obtain a more complete inventory as well as monitor the wildlife in the area.

Besides further inventory of the taxa covered during this short survey, there is a need for inventory of the diversity of other wildlife species including reptiles (such as the Peninsular rock agama *Psammophilus dorsalis* on the left) and frogs and caecilians found in the Havukal – Warwick estates.

Important ecosystems and habitats (Criterion 3.2 of SAN Standard): The **shola forest** fragments within these estates are vital for sustaining the diversity of wildlife species, and the **streams** too are important for myriad taxa such as the endangered Small-clawed Otter. Many mammals, especially large-bodied species such as Leopard, Sloth Bear, Sambar, and Gaur, are known to have large home ranges and the fragments provide vital refuge whereas plantations can provide connectivity among fragments and protected areas. While Havukal – Warwick do recognise these as conservation areas, there is need to continue protection efforts, recognise their role in minimising conflicts and encounters between people and large wildlife species by providing routes for animal movement, and identify degraded areas that may be restored with native vegetation. The important fragments are marked on the map and the larger **connectivity** with other sites such as Longwood Shola may be taken into account (Criterion 2.9). At the same time as recognising the macro-habitats, the importance of micro-habitats such as **dead trees** (snags, e.g., *Albizzia* in coffee), and the value of diverse **native shade trees** in sustaining diversity of wildlife may be noted and suitably incorporated in farm management decisions.



Remnant shola forests, natural vegetation along streams, and the streams themselves are vital ecosystems to be protected.

Retain large trees, especially native trees such as this *Toona ciliata*, as they support higher biodiversity.

Retain snags, or dead trees, as a valuable micro-habitat in plantations for species such as woodpeckers and barbets.

What bird should represent Havukal Tea?

Havukal tea currently uses a bird on its packaged tea as a symbol: Mountain Bluebird *Sialia currucoides*. This is not a native species of bird for India. It is in fact a bird found only in North America (see http://en.wikipedia.org/wiki/Mountain_Bluebird). From a conservation perspective, one would prefer a native species to this alien species. As revealed by this survey, the Havukal – Warwick estates have a diversity of native species to chose from, including some beautiful birds and species endemic to the region.

Possible options among native birds that may be considered to replace the Mountain Bluebird are:

1) **Nilgiri Laughingthrush:** This is an endemic bird found only in the Nilgiris in the whole world, and occurs in the estates/shola fragments
2) **Nilgiri Flycatcher:** This is a beautiful blue coloured bird endemic to the Western Ghats found in forests and forest edges in the upper reaches of the hills. In appearance it is somewhat similar to the Mountain Bluebird (the existing symbol) and may therefore be an ideal native replacement.
3) **Malabar Whistling Thrush:** A beautiful songster called the 'whistling schoolboy', this is a purplish blue-black bird found along streams in sholas and plantations.

Potential alternative endemic and native bird species for the Havukal Tea logo

Nilgiri Laughingthrush is an endemic restricted to the Nilgiris, found in pairs or small flocks in low shrubs (Photo: Kalyan Varma)

Nilgiri Flycatcher is endemic to Western Ghats in montane forests where one can hear its soft song (Photo: Kalyan Varma)

The Malabar Whistling Thrush, found along streamsides in the Western Ghats, is nicknamed the Whistling Schoolboy for its melodious whistles

Observations on implementation of SAN Sustainable Agriculture Standard

Good practices

We saw several good practices of SAN implemented in the estates such as:

- There were agrochemical-free no-spray zones close to schools and settlements.
- Protective gear was provided for the workers while spraying.
- There were several boards placed around the estates to create awareness.
- In coffee and cardamom we came across the some native shade tree species: *Albizzia sp., Syzigium sp., Schefflera sp.,* and *Toona ciliata*.
- We did not come across any animals in captivity or signs of hunting.
- The parapets along the roads were only a foot in height (high and continuous parapets without gaps can obstruct animal movement and crossings)
- The present survey was itself used as an opportunity by the Estate to collaborate with a conservation NGO in wildlife inventory as well as an awareness programme for workers.

Some suggestions for improvement

Although, there were several good practices, there were several areas where there is scope for improvement:

- In the buffer zone, especially near the schools and labour lines some native trees can be planted surrounding these regions and the height of this should be greater than the tea, separating the tea from the human habitation. **Use native species** such as the wild raspberries *Rubus sp.* (berries are eaten by Nilgiri Laughingthrush), *Justicia adhathoda* (Adathoda), and non-invasive naturalised species such as *Hibiscus* in such vegetated shrubby buffer zone around human use areas. **Avoid invasive alien species** such as *Lantana camara*, *Ipomoea* (morning glory), Scotch broom *Cystisus scoparius*) etc.
- We came across several open water tanks and wells. Except for one, near the temple in Havukal which had a covering grill, the rest of the wells were open. As the wild animals were frequently seen in this region, there is a risk of them falling and drowning in the wells (this is also a safety issue for people, especially children). Meshes may be placed over the open wells.
- In Erumaipatti settlement, the sewage is overflowing and the wastewater drains into a natural stream where we saw lots of signs of otters and civets. This pit has to be cleaned and maintained regularly.
- The bird deterrent in the factory may be removed and other alternatives should be sought.
- We suggest intead of cutting and removing dead *Albizzia* trees in the coffee plantations, these dead trees (snags) be retained as they serve as an important micro-habitat for bark-surface feeding insectivorous species such as the White-cheeked Barbet, woodpeckers such as the Greater Flameback and other birds such the Velvet-fronted Nuthatch. (Some birds may also nest in snags).
- Retaining large native trees and dead trees is also likely to help movement of arboreal mammals such as giant and flying squirrels, and primates.
- The practice of using native shade trees can be extended to the tea plantation as well through some field trials. For further information on native trees used in tea plantations please contact the keystone foundation(http://keystone-foundation.org/) and the following page can also be referred http://opendata.keystone-foundation.org/
- We have come across people collecting firewood from the forest fragments. This should be minimized and alternatives sought for the workers.
- Native vegetation such as *Debregesia longifolia* (*neer nochi or kaatu nochi* in Tamil), *Salix tetrasperma* (*Neer Vanji* in Tamil) may be grown along streams and ponds, as vegetated buffer zones.
- We came across trash in the forest thrown there by tourists. Although it was removed immediately, to ensure tourists act responsibly, signboards maybe placed around the estate.

Salix tetrasperma (Indian willow) is a useful native species for vegetated buffers along natural ecosystems.

Debregesia longifolia is an easy-to-grow native species, (leaves white below), suitable for buffers along streams.

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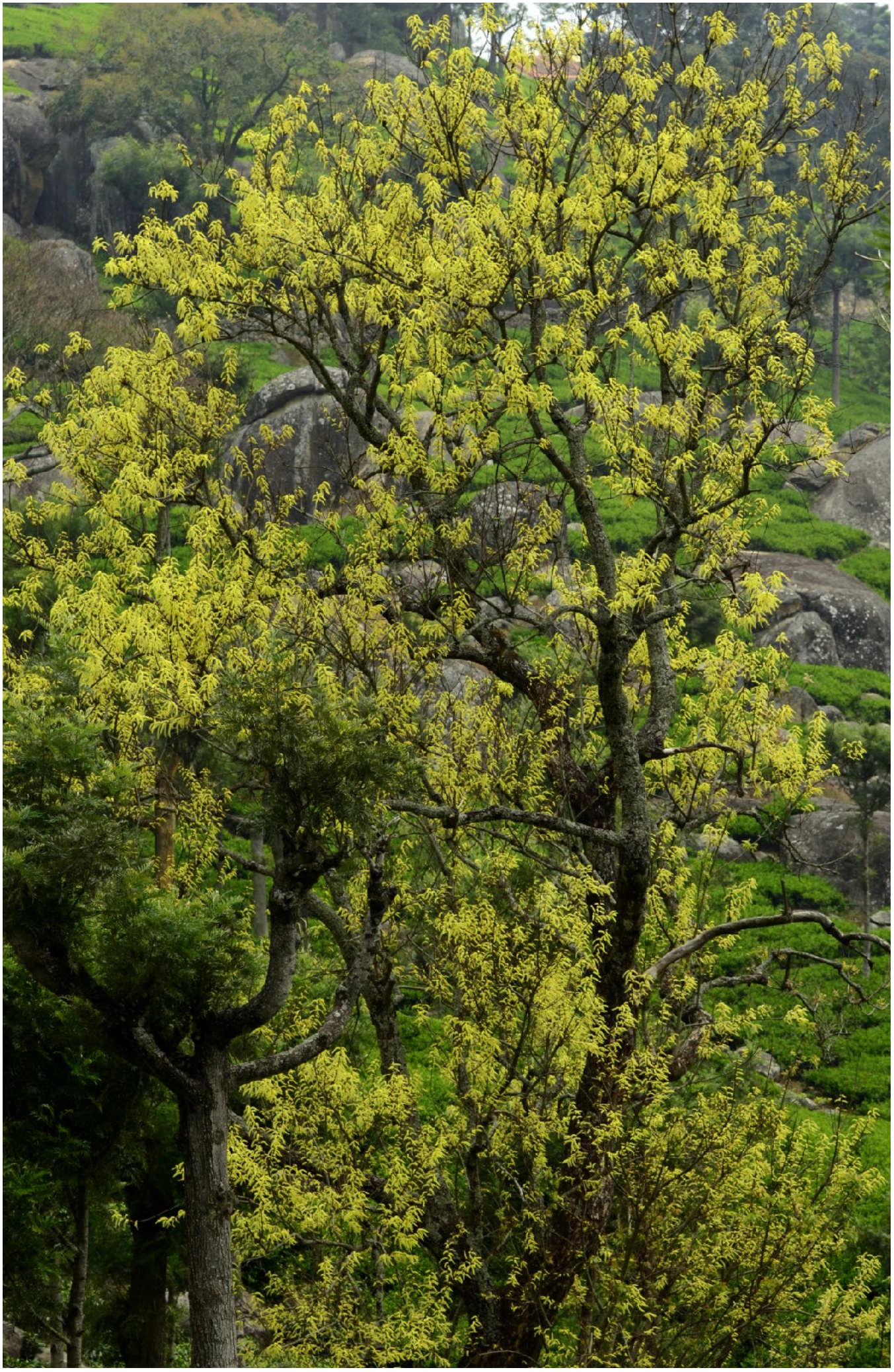
Useful websites

- **Ecoagriculture India:** http://ecoagriculture.in
- **Facebook page:** http://www.facebook.com/pages/Ecoagriculture-India/333535013922
- **Sustainable Agriculture Network:** http://www.sanstandards.org
- **Training Platform for Sustainable Agriculture:** www.sustainableagriculturetraining.org
- **Rainforest Alliance:** http://www.rainforest-alliance.org/
- **Nilgiris flora:** http://opendata.keystone-foundation.org/category/databases/flora-of-nilgiri-biosphere
- **Trees of Western Ghats:** http://www.ifpindia.org/biotik/about.php